

# MOTOR DRIVE FOR AN ELECTRIC ROLLING STEEL DOOR

## BACKGROUND OF THE INVENTION

The present invention relates to an electric rolling steel door,  
5 and more specifically to a motor drive for an electric rolling steel door.

Figures from 6 through 9 show a conventional motor drive for an electric rolling steel door. The motor drive comprises a speed reducer 2', a motor 1', and a control box 4'. The speed 10 reducer 2' comprises a power input shaft 26' coupled to the motor shaft 11' of the motor 1' by belt wheels 112' and a transmission belt 111'. The power input shaft 26' is mounted with a first chain wheel 22', a bearing 243', and a third chain wheel 24' on the bearing 243'. The third chain wheel 24' comprises a big sprocket 241' and a small sprocket 242'. A bearing 233' is mounted on the power output shaft 21' to support a second <sup>chain</sup> sprocket wheel 23', which comprises a big sprocket 231' and a small sprocket 232'. A fourth chain wheel 25' is mounted on the power output shaft 21'.  
20 Chains are coupled between the first chain wheel 22', the second chain wheel 23', the third chain wheel 24' and the fourth chain wheel 25'. The power output shaft 21' is mounted with a sprocket

211', which is coupled to a sprocket 51' at a shaft 52' of the rolling steel door 5' by a chain 212'. A sprocket wheel 28' is slidably mounted on the power input shaft 26' and retained in place by a spring 283'. The sprocket wheel 28' comprises two pins 282'.

5 A lever 3' is operated to press a push rod 31' thereof against the sprocket wheel 28', causing the sprocket wheel 28' to be moved to a locating pin 261', for enabling the sprocket wheel 28' to be turned with a chain 281' upon pulling of the chain 281' by hand.

10 Therefore, when power fails, the chain <sup>281'</sup> ~~282'~~ can be pulled by hand <sup>Λ</sup> to take up/let off the rolling steel door 5'. This structure of motor drive is still not satisfactory in function. The drawbacks of this structure of motor drive are outlined hereinafter.

- 15 1. Because a high power motor is needed to turn the low performance speed reducer, much power energy is consumed during the operation of the motor.
2. The complicated and heavy structure of the motor drive is expensive to manufacture, and requires much installation space.
3. Because low performance of the speed reducer, additional torsional spring means must be installed to automatically take up the shaft of the rolling steel door.
- 20 4. Because no brake means is provided, the rolling steel door

cannot positively stopped at the desired position.

### SUMMARY OF THE INVENTION

The present invention has been accomplished to provide a motor drive for rolling steel door which eliminates the aforesaid  
5 drawbacks. According to one aspect of the present invention, the motor drive comprises a motor, a speed reducer driven by the motor to take up/let off the rolling steel door, a brake disk turned with the motor shaft of the motor, a sprocket wheel moved along an axle and forced by a spring into engagement with the brake disk to stop the  
10 motor shaft of the motor from rotation, an electromagnet securely mounted on the axle and magnetized to attract the sprocket wheel for enabling the motor shaft of the motor to rotate freely upon starting of the motor, a lever operated by hand to disengage the sprocket wheel from the brake disk, a pivoted stop plate forced by  
15 spring means to stop the sprocket wheel from rotation, a chain mounted on the sprocket wheel and pulled by hand to disconnect the stop plate from the sprocket wheel, and a control box coupled to the power output shaft of the speed reducer to control the operation of the motor, wherein when the control box is controlled to start the  
20 motor, the electromagnet is magnetized to attract the sprocket wheel from the brake disk, enabling the motor shaft of the motor to

be freely rotated to take up/let off the rolling steel door; when power fails or is cut off from the motor and the electromagnet, the sprocket wheel is pushed forwards by the compression spring to stop the brake disk and the motor shaft of the motor from rotation.

5 According to another aspect of the present invention, the control box comprises a screw rod coupled to the power output shaft of the speed reducer by a transmission gear set, a set of movable members threaded onto the screw rod and forced to move along the screw rod relative to each other upon rotary motion of the screw rod, and a set 10 of contact switches driven by the movable members to cut off power supply from the motor when the rolling steel door is lowered to the lower limit position or lifted to the upper limit position. According to still another aspect of the present invention the motor drive further comprises a second contact switch disposed at one side of a 15 top rail of the rolling steel door for a secondary safety control, the second contact switch being triggered by a part of the rolling steel door to cut off power supply from the motor when the rolling steel door is lifted to the upper limit position.

#### BRIEF DESCRIPTION OF THE DRAWINGS

20 Figure 1 is an exploded view of the present invention.

Figure 2 is a sectional assembly view of the manual driving

mechanism according to the present invention.

Figure 3 is an exploded view of the control box according to the present invention.

Figure 4 is a sectional assembly view of the control box 5 according to the present invention.

Figure 5 shows the motor drive installed in a rolling steel door according to the present invention.

Figure 6 is a perspective view of a motor drive for a rolling steel door according to the prior art.

10 Figure 7 illustrates the structure of the speed reducer according to the prior art.

Figure 8 is a sectional view of the speed reducer according to the prior art.

15 Figure 9 shows the motor drive installed in a rolling steel door according to the prior art.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to Figures from 1 through 5, a high performance speed reducer 2 is coupled to a motor 1 at a front side. The speed reducer 2 comprises a plurality of mounting lugs 22 for installation.

20 The motor shaft 11 of the motor 1 is coupled to the power input end of the speed reducer 2. When the motor 1 is started, the power

output shaft 21 of the speed reducer 2 is rotated at a proper speed to provide an output power. A manual driving mechanism is coupled to the motor 1 at the back side remote from the speed reducer 2. The manual driving mechanism comprises a brake disk

5 111 securely mounted on the motor shaft 11 of the motor 1, a brake lining 112 securely mounted on the brake disk 111, a chain 323, a sprocket wheel 32 driven by the chain 323, an electromagnet 31 securely mounted in a shell 3, an axle 33 mounted in the center through hole 321 at the sprocket wheel 32 and a center through hole 311 at the shell 3 and the center through hole 311 at the electromagnet 31, a compression spring 331 mounted on the axle 33 and stopped between the electromagnet 31 and the sprocket wheel 32 to force the sprocket wheel 32 into close contact with the brake lining 112 at the brake disk 111 and to stop the motor 1, and a lever 34 mounted on the axle 33. The lever 34 has a mounting hole 341 near its one end, which receives the axle 33. A pin 342 is fastened to the axle 33 to secure the lever 34 in place. When the motor 1 is started, the electromagnet 31 is energized to attract the sprocket wheel 32, enabling the motor shaft 11 to rotate freely.

15 20 During the operation of the motor 1, a drive gear 211 which is securely mounted on the power output shaft 21 of the speed reducer

2 is driven to rotate a chain wheel 51, causing the chain wheel 51 to take up/let off the electric rolling steel door 5. A transmission gear train 212 is coupled between the power output shaft 21 of the speed reducer 2 and a screw rod 421 in a casing 42 inside a control 5 box 4. A set of movable members 422 and a set of contact switches 423 are mounted inside the casing 42 in the control box 4. A control circuit board 41 is mounted inside the control box 4. The movable members 422 are threaded onto the screw rod 421, and moved along the screw rod 421 to touch the contact switches 423, 10 so as to cut off power supply from the motor 1 and the electromagnet 31 when the electric rolling steel door 5 is lowered to the lower limit position or lifted to the upper limit position. When power supply is cut off from the motor 1 and the electromagnet 31, the sprocket wheel 32 is released from the 15 electromagnet 31, and pushed toward the brake lining 112 at the brake disk 111 by the compression spring 331, thereby causing the motor shaft 11 of the motor 1 to be suddenly stopped.

Referring to Figures 1 and 2 again, a stop plate 36 is pivoted to the shell 3 on the outside. A spring 362 is connected 20 between the stop plate 36 and the shell 3 to pull the stop plate 36 upwards. The stop plate 36 has a stop rod 361, which is inserted

through a hole 35 at the shell 3 into one of a series of peripheral holes 322 at the sprocket wheel 32 to stop the sprocket wheel 32 from rotary motion. When power fails, the chain 323 which extends out of a hole 3231 at the shell 3 is pulled to force the stop rod 361 of the stop plate 36 away from the sprocket wheel 32, and to rotate the sprocket wheel 32, enabling the brake disk 111 and the motor shaft 11 to be rotated with the sprocket wheel 32, and therefore the rolling steel door 5 is lowered or lifted manually. When the chain 323 is released from the hand, the stop plate 36 is returned to its former position by the spring 362, thereby causing the stop rod 361 to be engaged into one peripheral hole 322 at the sprocket wheel 32 to stop the sprocket wheel 32 from rotary motion. Further, the lever 34 can be pulled to disengage the sprocket wheel 32 from the brake disk 111, enabling the motor 1 to run idle and the rolling steel door 5 to fall freely. Because the speed reducer 2, the motor 1 and the manual driving mechanism are connected in a line, less installation space is required.

Referring to Figure 5 again, a contact switch 6 is disposed at one side of the top rail of the rolling steel door 5 for a secondary safety control. When the rolling steel door 5 is lifted to the upper limit position, the contact switch 6 is triggered to cut off power

supply from the motor 1.

It is to be understood that the drawings are designed for purposes of illustration only, and are not intended as a definition of the limits and scope of the invention disclosed.